July 3, 1992 Vol. 15, No. 12

Ferminews

FERMI NATIONAL ACCELERATOR LABORATORY

Director announces Accelerator Division appointments

David Finley

Bob Ducar

Vinod Bharadwaj

Director **John Peoples** has appointed the following individuals to administrative positions within the Accelerator Division, effective July 1, 1992.

David Finley is the new Deputy Head of the Accelerator Division. David earned his B.S., M.S., and Ph.D. in Physics from Purdue University. At Fermilab, he has served as Head of Switchyard, of the Collider Program and of the Tevatron Group. In 1990, he became Head of the Main Accelerator Department, and a year later took over the duties of Associate Division Head for Administration and Environment, Safety and Health.

As Deputy Head, David will assist Head **Steve Holmes** in the management of the Accelerator Division. This will allow Steve greater flexibility in devoting his efforts to the Main Injector Project. David is also responsible for coordinating the preparation of the annual budget request. He will monitor the technical and administrative aspects of accelerator improvement projects and other division undertakings, and serve as the division liaison to outside organizations such as the SSC.

Vinod Bharadwaj assumes the position of Associate Head for Systems. He had been the Acting Associate Head for Systems since September 1991. He received his B.A. and Ph.D. in physics from Balliol College of Oxford University in England. At Fermilab, Vinod has headed the Booster Department, and retains the position of Collider Run Coordinator.

The Associate Head for Systems is responsible for coordinating the activities of the Systems Departments, which include Linac, Booster, Pbar, Main Accelerator, Switchyard, Operations, Accelerator Physics and Neutron Therapy. Vinod will also serve as the Accelerator Division's liaison with the Research Division and the Technical Support Section.

Bob Ducar takes over the helm as Associate Head for Administration, Environment, Safety and Health. Bob majored in electrical engineering at the University of Detroit, then received an M.S. from the University of Illinois, Urbana-Champaign, in the same discipline with a concentration in control systems. Bob came to Fermilab more than 24 years ago, and has been a member of the Accelerator Controls Department since it was created. He is leaving the position of Associate Group Leader of AD Controls. Bob has chaired the Engineering Policy Committee and the Engineering Standards Committee, and currently heads the Electrical Safety Subcommittee of the Laboratory Safety Committee.

Bob's new position entails advising the Division Head on ES&H matters and overseeing the AD Headquarters staff. He serves as a liaison to the ES&H Section, and helps interpret Directorate implementation plans.

inside

Ferminews is published by the Fermilab Publications Office.
MS 107, P.O. Box 500
Batavia, IL 60510
708 840-3278
FNAL::TECHPUBS

The deadline for the Friday, July 17 issue of *Ferminews* is Wednesday, July 8. Please send your article submissions or ideas to the Publications Office.

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An improved CDF and a new DØ search for the top

This spring, physicists at CDF and DØ began their search for the most elusive of all subatomic particles, the top quark. The top quark is the last, and most important quark that researchers have yet to discover in the Standard Model. Its discovery will not only validate the Standard Model, but also give physicists at Fermilab a closer look at the conditions that existed at the beginning of the universe.

For those at Fermilab who are not all that familiar with understanding the constituents of matter, understanding how the CDF and DØ detectors operate may be as difficult as it is for physicists to find the top quark.

But, according to **John Cooper** of CDF, understanding how a colliding beam experiment works is as simple as understanding how a 10-speed bicycle works.

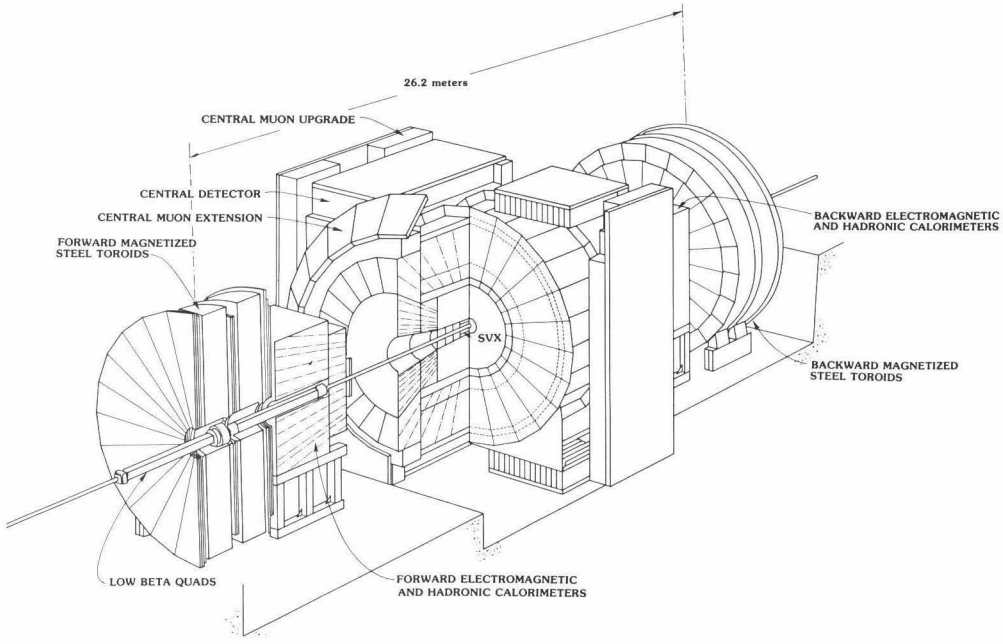
It is like colliding two bicycles together to understand how they work, Cooper said. By colliding them together with enough force to break the bicycles apart, you can then easily identify what they are made of. Cooper said this is the same principal used in high energy physics. To find out what protons and antiprotons are made of, you collide them together and examine the constituent quarks and gluons. Only, in high energy physics, the energy of the collision is so high that it is like colliding two bicycles together and occassionally getting a freight train to come out the side. The basic constituents of matter can be understood by understanding the kinds of massive particles that are generated through collisions. At CDF and DØ, physicists carefully examine the quarks that come out of collisions between protons and antiprotons. And as **John Butler** of DØ said, the process can be quite interesting. "Where you have the highest energy in the world (as we do at Fermilab), you don't know what you are going to find and that's what makes this exciting," Butler said.

To test the Standard Model and search for the constituents of matter, CDF, in this run, will be exploring the electroweak sector of the model and studying the electroweak and strong interactions, plus collecting large samples of particles containing the bottom quark, the partner to the top quark.

At DØ, researchers will be pursuing a similar physics menu by focusing on the identification of electrons and muons; measurement of neutrinos that do not interact with the materials within DØ; and detecting quark/gluon jets using their calorimeter.

The search for the constituents of matter starts with protons traveling clockwise in the Tevatron and antiprotons traveling counterclockwise in the Tevatron. When the protons and antiprotons cross paths in the middle of the detectors, collisions occur and the particles break into other particles. It is the job of CDF and DØ to record the tracks and the energy of these very short-lived particles. The first chamber that these particles enter following the collision are tracking chambers. At CDF this chamber is in a magnetic field that bends the particles according to their charge and momentum. This enables researchers to determine how energetic the particles are. If a particle has a positive charge, it

CDF Detector



bends one way and if it has a negative charge, it bends the other way. The amount of bending determines the momentum of the particle. At DØ, there is no central magnetic field and the particle trajectories are straight. The DØ tracking chambers measure the directions of the particles while their energy is determined in the calorimeter.

Surrounding the tracking chambers in each detector are calorimeter systems. These systems absorb and measure the energy of electrons, photons and hadrons coming from the tracking chambers. At CDF, the calorimeter is made of a sandwich layer of steel and plastic. As the particles hit the front of the calorimeter, they produce a shower of lower energy particles until totally absorbed. The particles, as they travel through the calorimeter, go across a scintillator with an attached photomultiplier which records the amount of light each particle gives off in the scintillator. By measuring the amount of light, physicists are able to see how much energy each particle has. In the back of the calorimeter is a system of chambers that measure muons, or particles that were not absorbed in the calorimeter.

At DØ, the calorimeter system is slightly different. Instead of layers of steel and plastic, DØ's calorimeter is made up of layers of uranium and liquid argon. As the particles hit, the energy is absorbed, and the particles produce more lower energy particles. The energy of these particles is then

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CDF upgraded for collider run

To help in the search for the top quark, researchers at CDF have improved and expanded the central detector.

According to **Robert Harris** of CDF, the detector was improved to handle the increased luminosities expected to come out of the Tevatron this run. Robert said CDF hopes to exploit these high rates to make precision tests of the Standard Model and to search for new phenomena, including the top quark.

CDF hopes to improve on existing studies of the electroweak and strong interactions, and collect large samples of particles containing the bottom quark, the partner to the top quark.

There were many new upgrades made to CDF since the 1988-1989 collider run. One upgrade was the addition of a new detector, the silicon vertex detector, or SVX. The SVX is located just outside the beam pipe and can distinguish the bottom quark decay vertex (secondary vertex) from the nearby collision point (primary vertex). According to **John Peoples**, this detector will substantially enhance the bottom quark detection capability of CDF. The SVX will also help CDF search for the top quark, which produces bottom quarks in its decay.

A second improvement was made to the central muon system. This improvement significantly increased the muon system capability. Two steel walls were placed on the north and south sides of the central detector and 856 new muon chambers and trigger counters were mounted on the outside of each wall. This allowed the existing central muon system to be covered with a second layer of muon detection.

This upgrade, Robert said, will substantially reduce backgrounds in muon identification. Along with the central muon upgrade, a third improvement was the addition of the central muon extension. This extension increased the angular region of muon detection by over 50 percent in the central region. Robert said this additional muon coverage will increase the chances of finding top quarks which produce muons in their decay.

A fourth upgrade was the addition of the vertex tracking system, or VTX. This replaces the vertex time projection chambers and is necessary for finding the event vertex.

A fifth upgrade, the addition of the central preradiator chambers, or CPR, is important for detecting direct photons in order to test the strong interaction and measure the gluon content of the proton. The CPR, Robert said, should also improve CDF measurements which use electrons, including bottom quark physics and the search for the top quark. Significant improvements were also made to the readout electronics and on-line

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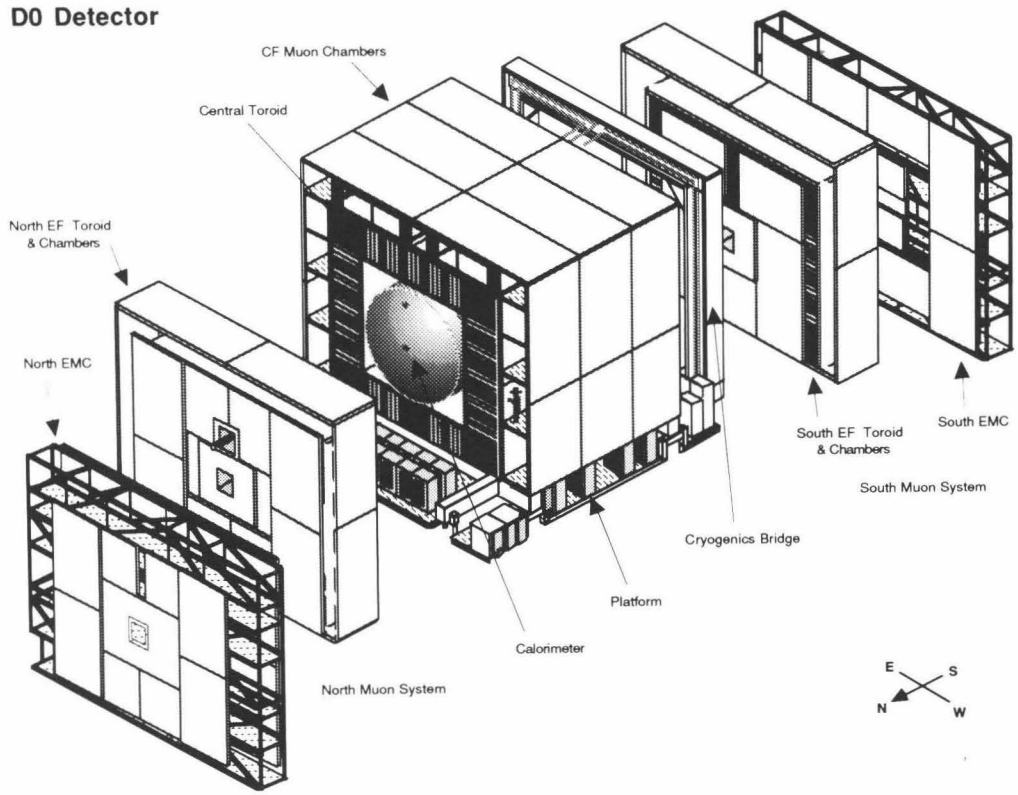
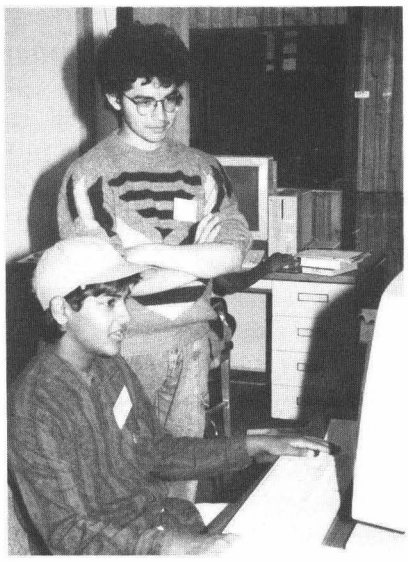
D0 Detector



DOE brings bright students to Fermilab

They're 59 of the brightest high school students in the world. They converged upon Fermi National Accelerator Laboratory, which houses some of the most sophisticated scientific equipment in existence. They crowded into lecture halls every morning to hear the latest developments in particle physics from eminent scholars. But at times, the teenage participants in the Department of Energy's High School Honors Program were more concerned about the physics of why a dormitory smoke alarm screams when you squirt it with a water cannon, and the engineering of a communications system using disconnected telephones. Such telephones, the inquisitive students discovered, conduct sound surprisingly well when dangled out dorm windows.



DOE honor student Anas Kagal of Montana watches as New York's Drew Narayan edits their group's report.

Despite their tendency to act like normal teenagers when away from their parents' watchful eyes, the DOE honors students are a remarkable group. The teens, whom coordinator **Drasko Jovanovic** once called "the exceptional one percent," are the beneficiaries of a program initiated by former Secretary of Energy John S. Herrington in 1987. Every year, DOE plucks the top junior and senior science students from all fifty states and several foreign countries, brings them to the national laboratories, and sets out to create scientifically literate adults, if not the physicists of tomorrow. This year's diverse group includes eight young women, eighteen high school juniors and students from Australia, Japan, Mexico and Germany.

"You've got some sharp kids here," said Nathan Roberts, a high school graduate from St. Simon's Island, Georgia, as he and his roommate, graduate Bill Piech of Northern Wilmington, Delaware, built a photomultiplier base in a Wilson Hall lab.

"Everyone has their own little strong points," added Texan Chris McNulty. "One of the best things is being able to talk to other students on the same level. I think sometimes you learn the most from your peers."

Oregon's Dan Shapiro agreed. "We were a little confused after one lecture, but at lunch we all sat down and figured it out. After we talked about it, everyone understood."

Lectures made up one portion of the students' Fermilab experience. Each morning, a Fermilab scientist presented a talk from the Saturday Morning Physics series. Afternoons were spent touring CDF, DØ and other sites, and building photomultiplier bases that will actually be used at the Laboratory. Students were divided into groups and assigned research projects as well. They then made a report on their projects to Drasko, who has run the Fermilab's DOE honors program since its debut in 1987, and their peers. "I saw it as an exercise to see what they could come up with when they apply themselves with enormous diligence," Drasko said. "These are motivated, competitive kids. They instantly wanted to make their reports absolutely perfect."

Texas' McNulty enjoyed the hands-on aspect of the program. "You feel like you're actually doing something," he said.

According to Drasko, teachers say that the 1992 students are "more industrious" than those in previous years. The group exhibited that industriousness both at the Lab and at Wheaton College, where they were housed. Area science teachers supervised the students. Besides attempting to invent a communications system, the students entertained themselves after hours by playing sports, gathering for card games and trading good-natured barbs about other students' home states. "There are more chickens in Wilmington than people," said Nathan Roberts of his roommate's home.

The students spent a Saturday visiting Chicago, making trips to the Museum of Science and Industry, the Hard Rock Cafe, and a White Sox game. The following Sunday, the students journeyed to Six Flags Great America for an informal but hands-on study of the physics of roller coasters.

While the students enjoyed their trips, one of their favorite events took place here at the Lab. "I somehow grabbed Leon Lederman," Drasko said. "They go for that."

Dan Shapiro chased Leon down later in the day to meet him personally. "I had to tell my physics teacher I shook his hand," Shapiro said.

Drasko himself proved quite popular with the students as well. "Drasko's cool," said Harvard-bound Liz Kelly of Wallingford, Vermont. Several students chimed their agreement. "He's one of the

Continued on page 8

Timeline: a date to remember

Linac enlists neutrons against cancer fight

July marks the beginning of one of Fermilab's most successful and perhaps best understood programs — cancer therapy. Seventeen years ago this month, the Fermilab linear accelerator first demonstrated that the Laboratory could conduct a program of high energy physics while simultaneously treating one of humankind's deadliest diseases.

The Neutron Therapy Facility came to life at approximately 2 a.m. on July 17, 1975 when the Accelerator Division created its first beam of neutrons out of protons feeding the Main Ring. Directed at tumors, beams of the chargeless particles would later prove highly effective at destroying their targets without damaging surrounding tissue.

Delivery of the first beam was only a midway point in the successful operation of the NTF and marked over two years of planning on the part of Director Robert Wilson and a team of Fermilab physicists working with Chicago-area oncologists. In 1973, the URA board of trustees recommended that Fermilab devise a plan to build and operate a cancer therapy facility. The idea wasn't completely novel; Wilson had imagined building such a machine for cancer treatment in the late 1940s. The Atomic Energy Commission quickly agreed with URA's recommendation, prompting Wilson to establish a Medical Application Committee in May of that same year.

The committee, led by Don Young and Miguel Awschalom, was responsible for determining the various design parameters for the proposed facility. Together with the Laboratory's architectural engineering firm and physicians from the area's leading hospitals and medical schools, the group discussed the merits of a proton therapy facility vs. a neutron therapy facility. Initially, the committee considered both types of particle beams for patient treatment, however, results showing tumor regression in patients at England's Hammersmith Hospital and at Texas A&M University ultimately weighed in favor of a dedicated neutron therapy facility.

Since neutrons were to be the particle of choice for patient treatment, the Fermilab Linac, in its present form as a proton-only particle accelerator, needed to undergo a transformation. A machine designed to accelerate protons to 200 GeV could not produce neutrons at the flick of a switch without some modification.

One of the considerations was obvious: the neutrons necessary for treatment would need to be manufactured using the Linac but in a manner that would not interfere with the normal operation of the accelerator complex. Here, the NTF was in luck. The Linac injects protons into the Booster accelerator eight tenths of a second out of every six second cycle, leaving a considerable excess of protons. If some of the excess protons could be diverted out of the Linac, these particles could be transformed into the precious neutrons vital to the NTF.

To accommodate the necessary structural changes, the Accelerator Division team moved the Linac's fifth radiofrequency accelerating tank seven inches downstream to make way for the extraction magnet that would carry the 67 MeV protons from the Linac through the shielding wall and into a neighboring room that held a beryllium target. Protons, brought to collide with the target, generate the uncharged neutrons desired for their ability to destroy cancerous tissue without damaging healthy cells. The medical and physics team measured the neutron beam's characteristics and dose distribution for five months, then began patient treatment on September 7, 1976.

By the time the first patient walked in the NTF door, neutron therapy had been in use in the United States for about four years. The National Cancer Institute agreed to fund the NTF on June 12 for the first year of its operation and continued to do so for almost ten years. By 1985, results from a national cooperative study showed that control rates in patients who had undergone neutron therapy were in excess of 50 percent for a variety of inoperable radioresistant tumors. The NCI concluded that neutron therapy was a proven and effective treatment, turning over funding and operation of the NTF to a partnership of physicians from 1985 to 1988. The facility, currently in its 15th year of operation, now operates under contract with Rush-Presbyterian-St. Luke's Medical Center.—*Brian Charles*

A hopeful Don Young tests the NTF controls in the Linac.

Saver reaches 512 GeV

Riggers had installed the last of 990 superconducting magnets in the Main Ring tunnel on March 18, 1983, and a celebration followed. Twenty-one months of work on the Energy Saver/Doubler project were nearing an end, not to be completely finished until the machine had met its design energy of 500 GeV.

Three and one-half months later, the champagne would flow again as the Energy Saver became the highest energy accelerator in the world. Two days of heavy thunderstorms beginning on July 1 slowed the attempts of Main Control Room operators to ramp the superconducting magnets, but gradual acceleration first to 250 GeV and then to the 400 GeV plateau indicated that 500 GeV success was not far away. At 3:37 p.m. on Sunday, July 3, 1983, just one hour and fifty-nine minutes after hitting 400 GeV, the Saver set a new bench mark for the world's particle accelerators when it reached a record 512 GeV.—*Brian Charles*

The Annual Report is here

Fermilab's *1991 Annual Report* has arrived! Employees wishing to pick up a copy may do so at the Public Information Office (WH1W) or the Publications Office (WH6NW). Additional pick-up sites are located at the Feynman Computing Center, the Industrial Center Building, the Housing Office, CDF and DØ.

Monograph available from ORTA

The proceedings of the 1991 Fermilab Industrial Affiliates Roundtable on Fermilab-Industry Cooperation is available from the Office of Research and Technology Application. The recently published monograph is the tenth in a series of "Roundtable" publications based on FIA meetings.

The 1991 monograph features a presentation on DOE's interest in industry-laboratory collaboration made by Cherri Lagenfeld of the DOE Office of Technology Analysis and highlights from Representative Dennis Hastert's talk titled "A Washington Perspective on Industry-Laboratory Collaboration." Also included in the monograph is an introduction by Director John Peoples and vignettes which highlight presentations made by Anthony Favale, Grumman Space Systems; Walter LeCroy, LeCroy Corporation; Carl Rosner, Intermagnetic General Corporation; Christopher Galvin, Motorola, Inc. and Jack Pfister, Rolland Johnson, Dan Green, Alan Bross and Gale Pewitt of Fermilab.

Interested employees, users or visitors can obtain a copy of the 1991 monograph by visiting ORTA, WH2SW or contacting Pat Oleck x3333.

Monographs of past Roundtables are also available from ORTA. They are: *Technology Transfer and the University-Industry Interface* (1982), *Supercomputer Developments in the Universities* (1983), *Industrial Participation in Large Science Projects* (1984), *Applications of Particle Physics: Out on the Limb of Speculation* (1985), *Science, Economics and Public Policy* (1986), *Research Technology and the Twenty-first Century* (1987), *Science-Technology Spiral and the Pace of Progress* (1988), *The Application of Accelerators* (1989), and *Fermilab III, the Great Computer Debate and Technology for the Nineties* (1990).

Spring/fall housing deadline

Final notice

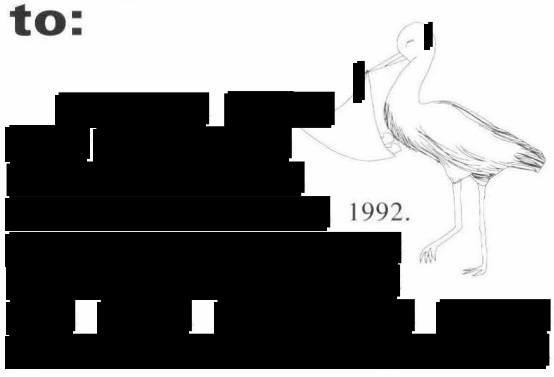
The deadline for receipt of requests for fall/spring on-site housing is July 10, 1992. Responses will be mailed by August 7, 1992. The starting date for fall/spring occupancy is September 1, 1992. For further information, please contact the Housing Office at x3777, e-mail FNAL:: HOUSING or FAX 708-840-2823.—*Pam Fox*

Don't forget to remember

Donate blood and give the gift of life

The Heartland Blood Center blood drive will be held on Monday, July 13 from 9 a.m. to 2 p.m. at the Users Center.

Congratulations to:



Attention golfers:

Fermilab Golf League is sponsoring a golf outing on July 17, 1992 at Village Greens in Woodridge. Secure your tee time by sending a $42 check (no cash), made out to Fermi Golf League, to Mike Ziomek, MS 340. Tee time reservations will not be taken by phone. No refunds. Checks must be received by July 8, 1992. Vacation day required. Watch for posters providing additional information.

Fermilab offers summer science fun for families

The staff of the Public Information Office, in conjunction with employee volunteers and presenters, is again offering summer Sunday tours in 1992. Summer Science Days at Fermilab, a new twist on the traditional site tours of the Laboratory, offers visitors a choice of three exciting ways to explore Fermilab.

On July 26, get ready for some "Serious Science." Visitors can chill out with live cryogenics and superconductivity demonstrations, or watch researchers as they piece together the most extensive map of the known universe on the Digital Sky Survey. If a particle collides in an accelerator, but no one saw it collide, did it make any new particles? Learn how physicists "see" matter so small as to defy human comprehension.

Who says science is boring? "Weird Science" on August 23 is the perfect way to get the kids in gear for another school year. Children of all ages can't help having fun when the Weird Scientists take the stage in Fermilab's Ramsey Auditorium for an afternoon of madcap science-magic demonstrations. The out-of-control chemistry teacher quartet, best known for their appearances on the "Late Night with David Letterman" show, perform homemade "experiments" that deliver learning and laughs.

On September 20, "Earth Science" day takes visitors back in time 150 years to pre-settlement days on the Illinois prairie. Vibrant tall grass prairie covered most of Illinois, but by the time of the Civil War the native grasslands had disappeared under farmers' plows. Take a walk through Fermilab's reconstructed prairie in full bloom and learn how environmentalists and just plain folks are bringing one of the largest prairie tracts in the country back to its former glory.

All Summer Science Days at Fermilab begin at 2 p.m. in Ramsey Auditorium and will last approximately two hours. Seating is limited for each program and reservations are required. Admission is free. To reserve your seat call or stop by the Public Information Office (x3351, WH1W) between 8:30 a.m. and 5 p.m. weekdays.

Gallery features Ingwersen's Italian landscapes

The Fermilab gallery is currently exhibiting the oil paintings of Chicago artist Mary Lou Ingwersen. The scenes of Italian landscapes, borrowed from the artist's private collection, are on display through July 31.

Summer Stevens and Jean Kidd (LS/Publications Office) admire the Ingwersen landscapes now on display in the 2nd floor gallery.

Ingwersen had an interest in painting while growing up in a Detroit household. Her family recognized her talent and encouraged her. She received a B.A. in art at Bennington College in Vermont, and then continued her education at Cranbrook Art Academy. A period of eighteen months of study in Paris included a painting workshop with Fernand Leger and a longer period of study with Andre Lhote. She has won awards as an artist and continues to study and travel in France, England and Italy in the pursuit of developing her painting. The majority of her painting is done in her studio in Chicago.

Her work has been included in the collections of eighteen corporations. Some of them are Montgomery Ward, Schiff, Hardin & Waite, Illinois Tool Works, McKinsey & Company and Household International. Ingwersen has paintings in more than 200 private collections.

In her early work, Ingwersen did figurative paintings and experimented with cubism. Today she is a contemporary colorist/expressionist within the context of landscape. Her own perception of the countryside evolved using patterns of color brushed on and juxtaposed as bright and bold shapes. Although she paints large splashes of bright colors, the relationship between colors on the canvas is subtle. She interjects stress lines that add perspective and create a force that enhances the atmosphere of her landscapes. At this stage of her painting career she has thrown off the influence of others. Her style is totally her own.—*Delores Pearl*, Editor, *Art Whirl*

Arts & Crafts Show approaches

The Fermilab Arts & Crafts Show begins August 8 and continues through August 31. Applications to enter the show are available at the reception desk in the atrium of Wilson Hall. Applications must be mailed to Saundra Poces, MS 105, by Friday, July 31.

All Fermilab employees, visiting scientists, retired employees, contractors and their immediate families are encouraged to enter the exhibit.

Daycamp has openings

The Fermilab summer daycamp currently has openings for Session II (July 6 through July 18) and for Session III (August 3-August 21). Children must be between the ages of seven and 12. If interested, please call Sheri or Jean, x4544.

Correction

Bruce Baller's job title was incorrectly listed in the URA scholarship article which ran in the June 5 issue of *Ferminews*. Bruce is an Associate Head of the Research Division.

Quality corner

The Quality Assurance and Conduct of Operations Office received the following question.

Question: The May 8 issue of *Ferminews* had a great article about recycling white paper. Is *Ferminews* itself printed on recycled paper?

Answer: Absolutely. The newsletter you are reading was printed on 50% waste paper.

The Environmental Protection Agency defines waste paper as both pre- and post-consumer refuse. Pre-consumer waste includes by-products of the process such as envelope cuttings, butt rolls, mill wrappers and bindery trimmings. This category also encompasses obsolete inventories of paper from industry and business.

More importantly for our environment, manufacturers use post-consumer waste in making the paper on which *Ferminews* is printed. Post-consumer waste paper includes paper from residences, schools, offices and manufacturing firms that has been used and discarded. Paper collected from municipal solid waste also falls under this heading.

Even if we at the Publications Office were not environmentally conscious, *Ferminews* would still, in all likelihood, be printed on recycled paper. Section 6002 of the Resource Conservation and Recovery Act has mandated since June 1989 that all agencies of the federal government implement preference programs favoring paper made with recovered material. The Government Printing Office, which oversees the awarding of printing contracts for the Publications Office, promotes "the use of a recovered materials content to the maximum possible extent in its solicitations and contracts. Offerors are urged to supply paper and paper products that contain recovered materials."

Ferminews is also recyclable. When you are through reading it, drop it in the nearest recycling receptacle. Remember to remove the gummed address label first!

The Publications Office has a list of mills and converters of paper products made from waste paper. Also available is an EPA-sponsored list of recycled-paper distributors. Stop by the Publications Office, 6NW, for more information.

If you have a suggestion on how to improve the quality, efficiency, reliability or effectiveness of a Laboratory service or operation, please send it to Mark Bodnarczuk, MS 200 or Bitnet Bodnarczuk@FNAL.

CDF and DØ

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detected in the liquid argon and read out.

At DØ, muons are detected in a system of muon tracking chambers which surround large magnetized iron toroids located just outside the calorimeters. The magnetic field of the toroids bends the muon's trajectory allowing researchers to measure its momentum.

Not all particles can be detected in the tracking chambers and calorimeters of CDF and DØ. Neutrinos do not interact in the detectors. Physicists, however, detect neutrinos when they see energy in one direction, but none in the opposite direction. Since there is nothing balancing the energy, this "missing energy" can then be assigned to a neutrino.

Since a top quark is very short-lived and decays quickly into many other particles, including muons, electrons and quarks, finding it is difficult. To help isolate the top quark, physicists record many of the collisions on computer tape selected by a computer triggering system. These triggers sort out the "bad" samples from the "good" samples and "throw out" most of the uninteresting data. At CDF, there are three levels of triggers. Each level acts as a sieve to reduce the number of unwanted collisions. At DØ, there are four increasingly complex levels of triggers that sort out the unwanted events.

This process is not an easy one and it can take several years to sift through the data collected from one run. "These are complicated detectors. Each one has a little bit of its own magic that goes with it. When you get down to what you constructed and what wire and what gas you used, things like that, well, it almost gets to the level of folklore and magic."

DOE Honor students

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most awesome speakers," Shapiro added.

Drasko and the rest of the Lab employees who helped host the DOE honors students seem to have fulfilled their mission to help foster young people's interest in science. "I think I'm going to minor in particle physics," said McNulty.

"I was always interested but I really didn't know what particle physics was all about," Shapiro said. "I wish more people could do this. I think a lot of people would be interested."

While only 59 students studied at Fermilab this summer, other students attended DOE honors programs at Los Alamos, Brookhaven, Argonne, Lawrence Berkeley, Lawrence Livermore and Oak Ridge National Laboratories. DOE covers the students' travel expenses and their accommodations for the two-week workshops. The program has proved to be an investment; approximately a dozen alumni of DOE honors programs are currently spending their summer working at Fermilab. Four more are physics graduate students, and Drasko has written dozens more letters of recommendation for pending graduate school applications.

Students stressed the broad appeal of their educational experience at the Lab. "You have to be interested in science, but you don't have to be strong in any particular area," Kelly said. "I think it's great."

Benefit notes

URA adopts new CREF account

On July 1, 1992, CREF added its newest investment account, CREF global equities, to its family of funds, and URA added the new account to the Laboratory's retirement plan. The new account generally invests at least half its holdings in foreign capital markets. At least one quarter is invested in domestic markets, and the remaining 25% is invested as situations and opportunities arise both at home and overseas. To allocate contributions or to transfer accumulations call TIAA-CREF at 1-800-842-2252.

Need claim forms or CG ID cards?

The Connecticut General Claims Office does not keep a supply of Fermilab claim forms and ID cards. Connecticut General claim forms and ID cards are available from the Benefits Office, 15WHSE. The new medical claim forms are on the same wall rack as the dental claim forms. If you are not located in Wilson Hall, call x3395, 4362 or 4361 and forms will be mailed to you.

How to complete the new CG medical claim form

While you read this article, you may want to have the new CG medical claim form near you for reference. Your medical bills will be processed faster if you follow the instructions below.

Employee information section:

Only items A, B, C, D, E, F and J ('x' active or retired box) of the employee information section need to be completed.

Patient information section:

Complete the entire section only if the patient is a dependent.

Accident/occupational information section:

Complete this section only if the claim is a result of an accident or occupational illness or injury. (Connecticut General covers an occupational illness or injury claim only when the workers' compensation carrier denies the claim. Include the denial with your claim submission.)

Family/other coverage information section:

Complete the entire section if the claim is for a dependent, or if you have other coverage in effect such as Medicare or other group insurance. Attach a copy of the other carrier's payment voucher or explanation of benefits.

Employee's/patient's signature and release section:

The patient (parent or guardian if the claim is on a minor) must sign and date Item A. The date should be concurrent with the date of service or after the date of service.

The employee should sign and date Item B when the employee wants Connecticut General to pay the health care provider. The date should be concurrent with the date of service or after the date of service. Do not sign Item B when you want to be reimbursed.

Physician or provider section:

Do not complete this section as long as you attach an itemized bill to the claim form. Do not attach balance due statements, receipts and cancelled checks because they are not itemized bills.

Instructions for filing a claim section:

This section provides in detail some important tips, such as: a complete claim form should be submitted with every claim submission; itemized bills should include the employee's name, type of service, date of service, diagnosis and charge for service; prescription drug bills should be taped to an 8 1/2 x 11 piece of paper; you should make copies of your bills and mail them to Connecticut General. Please read this section of the form carefully.

It is acceptable to submit a copy of a claim form as long as the information has not changed, but be sure the signature and release section has an original signature and date. Connecticut General receives 20,000 claims per day, and claims with all the necessary information get processed more quickly.

If you have any questions regarding the claim form, please feel free to call the Benefits Office, x3395, x4362 or x4361.

CDF upgrade

continued from page 3

and off-line computer systems at CDF to help cope with the increased flow of data and the increased computing needs to process the data.

With the improvements in place, the first level trigger at CDF is now able to make a decision every time the beams cross. Previously, it took twice the time between beam crossings to make the decision whether or not to keep the data.

The ACP computer farm which made the third level trigger decision was replaced by more powerful Silicon Graphics processors.

The off-line computer farm, which reconstructs events, was expanded to process the increased number of events at the same rate as it is produced.

Robert said future enhancements to CDF are on the horizon and should be in place sometime in 1995. These upgrades will include improvements to the SVX and to the end plug calorimeter, in addition to completely new electronics, trigger and data acquisition systems.

Classified ads

Real estate

Three-bedroom townhouse with attached garage in a quiet subdivision of Warrenville, very close to Fermilab. All appliances. Price to sell at $93,500, rent-to-buy option, seller-finance options are welcome. Call x4597 or 708-983-0279, FNAL::B94786.

Miscellaneous

Four tires, Goodyear Polysteel P225/70R15. Raised white letters. Half of tread left. $50 for the set or $30 per pair. Call Marc at x4189.

Readers' Digest 3-speed record and 8-track tape stereo console, $50. Call Ron, x3095.

14" color monitor, .31MM pitch, 640 x 350-resol., $125. Call Reehal, x4191.

Fridigaire refrigerator, white, $50; Century child's car seat and Gerry baby stroller, $25 each; Brother typewriter, $10. Call Robin, x2982 or FNAL::ROBIN.

Seductive but sturdy: "This end up" love seat, pine frame with Santa Fe pattern cushions. Almost new, excellent condition, must sell. $250 obo. Call David Herrup, x2558 or 708-393-3947.

Dome tent (sleeps two). Size 6' 6" x 6' 6" x 4'. Excellent condition. Asking $25. Call Daniel, x3604, 708-416-0195.

Nalrec news

Whitewater rafting trip:

Nalrec still has a few openings for the July 18-19 whitewater rafting trip in Wolf River, Wisconsin. Cost is $90 for one night's stay in a motel, bus ride, snacks in transit and a total of 10 1/2 hours rafting. Call Dominick, x3187.

Golf outing:

The first annual Nalrec golf outing takes place July 24 at Palmer Hills Golf Course in Iowa. The $67 fee includes snacks and beverages on a deluxe motor coach, 18 holes of golf and an afternoon cruise on Casino Rock Island with complimentary deli-buffet and soft drinks (alcoholic drinks cost $1). Also covered are entertainment, a buffet dinner following the cruise and beverages on the trip home. Registration deadline is July 14. Call Gary Smith, x3878.

Great America trip:

The Six Flags over Great America family outing is scheduled for August 16, 10 a.m. to 10 p.m. The $22 fee includes an all-you-can-eat buffet luncheon. See posters or contact Jesse Guerra, x4305.

Bears trips:

Nalrec is sponsoring the following trips to Chicago Bears games:

Bears v. New Orleans Saints-September 11-14. Cost is $429 per person and includes round trip air, three nights' hotel lodging, shuttle bus, game ticket, pre-game party and tour escort.

Bears v. Tampa Bay Buccaneers-November 13-16. Cost is $399 per person and includes round trip air, three nights' hotel lodging, game ticket, pool party, tour escort plus other options.

Bears v. Detroit Lions-December 19-20. Cost is $119 per person and includes deluxe motor coach, snacks, hotel accommodations for one night, game ticket, pre-game party and tour escort.

Questions? Contact Jesse Guerra, x4305.

Branson music jamboree:

Watch for posters advertising the Branson Music Jamboree, a five-day, four-night trip offered November 4-8, 11-15 or 18-22. Cost is $419 double accommodations, $499 single accommodations for a deluxe motor coach trip to Branson, Missouri. Five meals are included.

Tour highlights include a tour of the School of the Ozarks and trips to Silver Dollar City and Waltzing Waters. Travelers will see four country music shows, including the Baldknobbers Jamboree, Shoji Tabuchi Theater, Roy Clark Theater and Grand Place Music Theater.

A $50 deposit is required to hold your spot. Final payment is due thirty days before date of departure. For more information, contact Jesse Guerra, x4305.

Old Timers' Steak Fry:

Mark August 14 on your calendar. It's the Old Timers' Steak Fry, our big event for the summer. Watch *Ferminews* for more details.

T-shirt raffle:

The following peoplewere winners in Nalrec's T-shirt raffle: **Don Mansell**, **Jim Toynton**, **Jo Anne Mansell**, **Janet Carlslide**, **Rick Voeka**, **Gary McBride**, **Colleen Choy**, **Derrick Smith**, **Bill Gatfield**, **Ray Nemec**, **Freedy Nang** and **Erin Best**.

Classified ads continued

0.45 carat Marquis cut diamond ring with accompanying gold ring. Appraised at $1600, will sell for $850 or reasonable offer. Mike, x2479 (days) or 708-879-6095.

Pets

Small cat available for adoption. 1-year-old male, neutered, declawed front paws, American domestic shorthair, black & white, has had all shots, super friendly. Call Gina, x2660.

AKC black Labrador puppies, family raised. 4 females, 3 males. Ready to go July 10. $200 and up, with papers. Call Denise, x3585 or 708-879-8256 after 4 p.m.

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